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## Electronics Technology Will Create Safer And More Reliable Cars.(Company Business and Marketing)

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Automotive advances tend to show up in luxury vehicles, mainly because consumers are willing to pay a premium for the latest and best technology. We recently spoke with Peter Patrone, department manager of the Advanced Product Planning Group, Mercedes-Benz, about current and future plans for specific automotive technologies.

ED: Wireless automotive communication services will eventually allow remote updates for features like improved engines, enhanced braking control, and new entertainment options. What kinds of security issues arise because of remote vehicle access? Also, what approaches will be taken to make such changes secure?

Patrone: Firewalls are a necessary part of any networks used in a moving vehicle where safety is paramount. The placement and number of firewalls is very system-dependent, and we address this on an individual basis.

Consumers and other vendors will have access to noncritical networks, such as those providing infotainment support. But, crossing into engine and safety controls will require the use of stricter authentication and encryption services.

Mercedes-Benz is a real believer in telematics and expects it to be a part of every vehicle over the next five years. Communication and convenience services are already available through the Mercedes-Benz Info button. It provides real-time answers to questions on travel information. We expect improvements in this area so that navigation systems can take into account centrally available, real-time traffic and road-condition information, as well as remote diagnostic support.

ED: What advantages and issues do you see with X-by-wire technology, and what kinds of X-by-wire technology do you think will be made available to the consumer first?

Patrone: Mercedes-Benz already utilizes throttle-by-wire support in almost three-quarters of its current models, including the C class, E class, S class, CL class, and one of the SL models. The throttle-by-wire control has no mechanical connections and provides very reliable engine control. It also allows the controlling computer to make adjustments based on details, such as the pedal's rate of acceleration. Adjustments to the engine's performance are based on what the driver wants versus what a direct connection would do to fuel delivery via a fuel-injection system. This allows a computer to also take into account current engine performance characteristics.

Incorporating other X-by-wire technologies will require even more reliable and redundant computer networks. We expect brake-by-wire to be one of the next technologies implemented by 2005. Steer-by-wire may be available by the 2005 model year, but it will be close. As with any new technology that we add, there must be a clear benefit to the consumer, such as reduced cost, enhanced reliability, or improved performance.

ED: What kinds of fuel economy do you expect over the next five years? Will new savings be attained using improved internal-combustion engines or hybrid systems?

Patrone: Thanks to a combination of electronic and mechanical valve improvements, our active cylinder-control (ACC) technology provides a 20% fuel-economy improvement by essentially shutting down part of the engine when maximum performance isn't needed, as in low-speed driving, or idling in stop-and-go traffic. From a driver's perspective, there's no change in driving performance because system operation is completely transparent.

ED: On-board automotive computing power is expected to increase significantly over the next five to 10 years. To what degree do you see self-diagnostics coming into play, and will it reduce the complexity of external test and diagnostic equipment in dealer service departments?

Patrone: A flexible service system will not only allow notification of service requirements on a dynamic schedule, but will also allow drivers to query the system as to when service is needed. Drivers can thus plan for service needs in advance, like for a long trip, and have it taken care of ahead of time.

Built-diagnostics will also improve service support at non-dealer locations that will not have the extensive service computers that a dealer's service department will have. This is critical because diagnostic devices may not always be available at a service location when a component fails or an accident occurs.

Self-diagnostic research will also be pushing predictive diagnostics. This will allow notification of a pending failure prior to a problem actually occurring. This will initially be targeted at critical subsystems, such as braking.

Although self-diagnostics will help, it won't be a complete replacement for dealer-based diagnostic services.

#### Embedded Systems Will Make Cars More Aware Of Their Surroundings

Mercedes-Benz expects improvements across all fronts, from increased performance through engines with higher specific output to wireless communications, providing advanced consumer services. Overall, cars will be much more aware of their surroundings through the use of new sensors. This information will be processed by a network of embedded systems providing drivers with immediate feedback regarding critical information, like road hazards and engine performance.

We expect to achieve even lower emissions through a combination of new engine design (cylinder head), as well as the use of improved electronics for engine management control. Our current S500 five-liter models are already ultra-low-emission vehicles with very low cold-start emissions. We expect our present very good emissions at the exhaust port, prior to the catalytic converter, to continue to improve.

Safety systems will keep improving with more anticipatory safety systems, such as collision-detection systems, becoming standard features. These kinds of changes will be based on advances in vision, radar, and ultrasonic technology combined with the continuing use of advanced computer technology.

Finally, intelligent maintenance will improve automobile life and reliability while reducing costs. For example, advanced monitoring systems will allow scheduling of oil changes based on details like engine operating conditions instead of simplistic three-month or 3000-mile rules. Advanced monitoring will notify drivers that service is needed sooner for heavy-duty driving and later if a vehicle sees light use.

Likewise, many systems, such as braking and the transmission, are essentially sealed for life, requiring maintenance under rare conditions.

We expect future gains in transmissions through the use of continuously variable transmission (CTT) technology. In the past, a CVT was available from another vendor on a specific model, but it's used in any car sold today. While a GVT requires sophisticated electronic controls, it delivers a smoother ride, improved engine efficiency, and lower emissions.

Hybrid systems will eventually be used, especially with electrical engines coming into play for low-speed operation. The time frame for these hybrid systems to emerge is still in a state of flux, but there should be a few commercially available hybrid designs by 2005.

Voice-recognition (VR) development will be critical. We were first with user-independent VR in our cell-phone system. VR will play an important part in future wireless and entertainment controls. We expect greater wireless bandwidth in cars, making new services available, like Internet access and travel planning.

Interviewed by William Wong.

Overall, cars for the 2005 model year will be more efficient, more reliable, and easier to maintain. They will also have more safety and wireless features that will be less expensive and more advanced than those in the current vehicles.

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